

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent No. : 7,323,651 Confirmation No. 7554  
Inventors : JEONG et al.  
Issued : January 29, 2008  
Title : Method for Isotope Separation of Thallium  
Examiner : Edna Wong  
Customer No. : 28289

REQUEST FOR CERTIFICATE OF CORRECTION OF PATENT

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

ATTENTION: Decision and Certificate of Correction  
Branch of the Patent Issue Division

Sir:

In accordance with 35 U.S.C. §§254 and 255, we submit herewith Form PTO/SB/44 and a copy of proof of errors and request that a Certificate of Correction be issued in the above-identified patent. The following errors appear in the patent as printed:

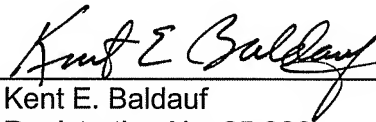
- (1) See the Drawings, Sheet 2 of 7, bottom left side, " $6^2\text{P}_{3/2}$ " should read --  $6^2\text{P}_{1/2}$  --  
(See the Amendment After Final Rejection, dated August 13, 2007, and the accompanying annotated replacement sheet of FIG. 2. FIG. 2 is also shown on the face of the patent.)  
**(The replacement sheet and the annotated sheet are different. The PTO used the replacement sheet as their guide. The annotated sheet is correct.) A NEW CORRECTED REPLACEMENT SHEET IS SUBMITTED FOR YOUR CONVENIENCE.**
- (2) See the Drawings, Sheet 2 of 7, bottom right side, " $6^2\text{P}_{1/2}$ " should read --  $6^2\text{P}_{3/2}$  --  
(See the Amendment After Final Rejection, dated August 13, 2007, and the accompanying annotated replacement sheet of FIG. 2. FIG. 2 is also shown on the face of the patent.)  
**(The replacement sheet and the annotated sheet are different. The PTO used the replacement sheet as their guide. The annotated sheet is correct.) A NEW CORRECTED REPLACEMENT SHEET IS SUBMITTED FOR YOUR CONVENIENCE.**
- (3) Face of the Patent, FIG. 2, bottom left side, " $6^2\text{P}_{3/2}$ " should read --  $6^2\text{P}_{1/2}$  --  
and bottom right side, " $6^2\text{P}_{1/2}$ " should read --  $6^2\text{P}_{3/2}$  --
- (4) Column 3, Line 6, "is side" should read -- is a side --  
(See the Amendment dated January 16, 2007, page 3, line 13.)

- (5) Column 3, Line 16, "shows is the" should read – shows the –  
(See the Amendment dated January 16, 2007, page 3, line 20.)
- (5) Column 4, Line 48, "temperative" should read – a temperature –  
(See the Amendment dated January 16, 2007, page 4, line 30.)
- (7) Column 4, Line 49, "affect on the" should read – affect the –  
(See the Amendment dated January 16, 2007, page 4, line 31.)

The errors numbered (1), (2) and (3) are obvious typographical errors made by Applicants. The Commissioner of Patents and Trademarks is hereby authorized to charge the fee of \$100.00 for correction of Applicants' mistakes by credit card. The credit card information accompanies this request. The remaining errors are printing errors.

Respectfully submitted,

THE WEBB LAW FIRM

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# **UNITED STATES PATENT AND TRADEMARK OFFICE CERTIFICATE OF CORRECTION**

Page 1 of 1

PATENT NO. : 7,323,651  
 APPLICATION NO. : 10/522,461  
 ISSUE DATE : January 29, 2008  
 INVENTORS : JEONG et al.

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

See the Drawings, FIG. 2, bottom left side, "6<sup>2</sup>P<sub>3/2</sub>" should read -- 6<sup>2</sup>P<sub>1/2</sub> --

See the Drawings, FIG. 2, bottom right side, "6<sup>2</sup>P<sub>1/2</sub>" should read -- 6<sup>2</sup>P<sub>3/2</sub> --

Face of the Patent, FIG. 2, bottom left side, "6<sup>2</sup>P<sub>3/2</sub>" should read -- 6<sup>2</sup>P<sub>1/2</sub> --  
 and bottom right side, "6<sup>2</sup>P<sub>1/2</sub>" should read -- 6<sup>2</sup>P<sub>3/2</sub> --

Column 3, Line 6, "is side" should read -- is a side --

Column 3, Line 16, "shows is the" should read -- shows the --

Column 4, Line 48, "temperative" should read -- a temperature --

Column 4, Line 49, "affect on the" should read -- affect the --

MAILING ADDRESS OF SENDER: The Webb Law Firm  
 700 Koppers Building  
 436 Seventh Avenue  
 Pittsburgh, PA 15219

This collection of information is required by 37 CFR 1.322, 1.323, and 1.324. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1.0 hour to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-2450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Attention Certificate of Corrections Branch, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

*If you need assistance in completing the form, call 1-800-PTO-9199 and select Option 2.*

Response Under 37 CFR 1.116  
Expedited Procedure  
Examining Group 1753  
Appl. No. 10/522,461  
Amdt. dated August 13, 2007  
Reply to Office Action of March 14, 2007  
Attorney Docket No. 1455-050205

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No. : 10/522,461 Confirmation No. 7554  
Applicants : Do-Young JEONG et al.  
Filed : Jan. 25, 2005  
Title : Method for Isotope Separation of Thallium  
Art Unit : 1753  
Examiner : Edna Wong  
Customer No. : 28289

**MAIL STOP AF**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

**AMENDMENT AFTER FINAL REJECTION**

Sir:

In response to the final Office Action of March 14, 2007, Applicants submit the following amendments and remarks, along with a Petition for Extension of Time and requisite fee:

**Amendments to the Specification** begin on page 2 of this paper.

**Amendments to the Claims** are reflected in the listing of claims which begins on page 3 of this paper.

**Amendments to the Drawings** begin on page 6 of this paper and include both an attached replacement sheet and an annotated sheet showing changes.

**Remarks** begin on page 7 of this paper.

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on August 13, 2007.

\_\_\_\_\_  
Diane Paull

(Name of Person Mailing Paper)

*Diane Paull*  
\_\_\_\_\_  
Signature

08/13/2007  
\_\_\_\_\_  
Date

**Response Under 37 CFR 1.116**  
**Expedited Procedure**  
**Examining Group 1753**  
Appl. No. 10/522,461  
Amdt. dated August 13, 2007  
Reply to Office Action of March 14, 2007  
Attorney Docket No. 1455-050205

**Amendments to the Drawings:**

The attached sheets of drawings include changes to Figs. 2 and 3 to amend measurement numbers to coincide with those set forth in the specification.

Attachments: Replacement Sheets  
Annotated Sheets Showing Changes

2/7

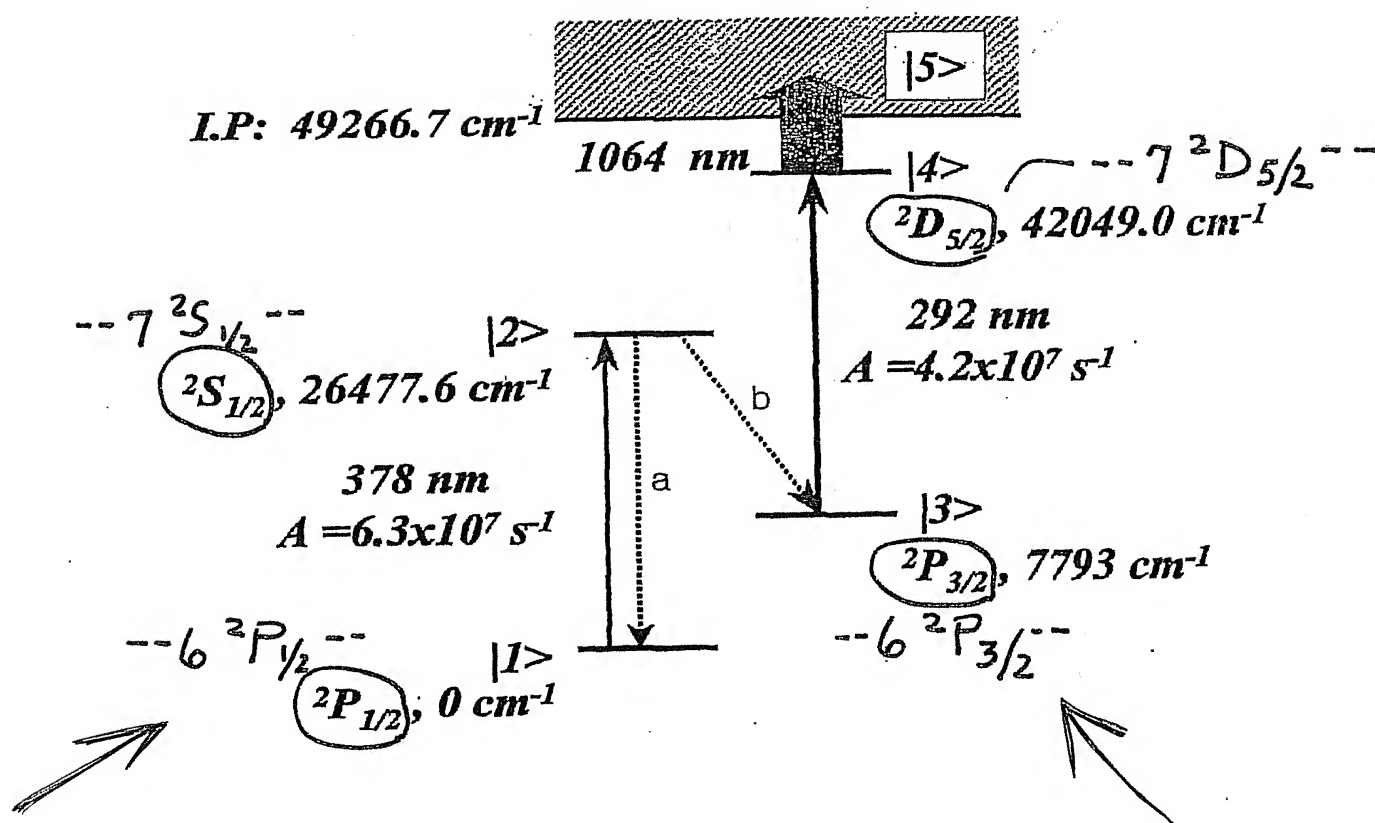


FIG. 2

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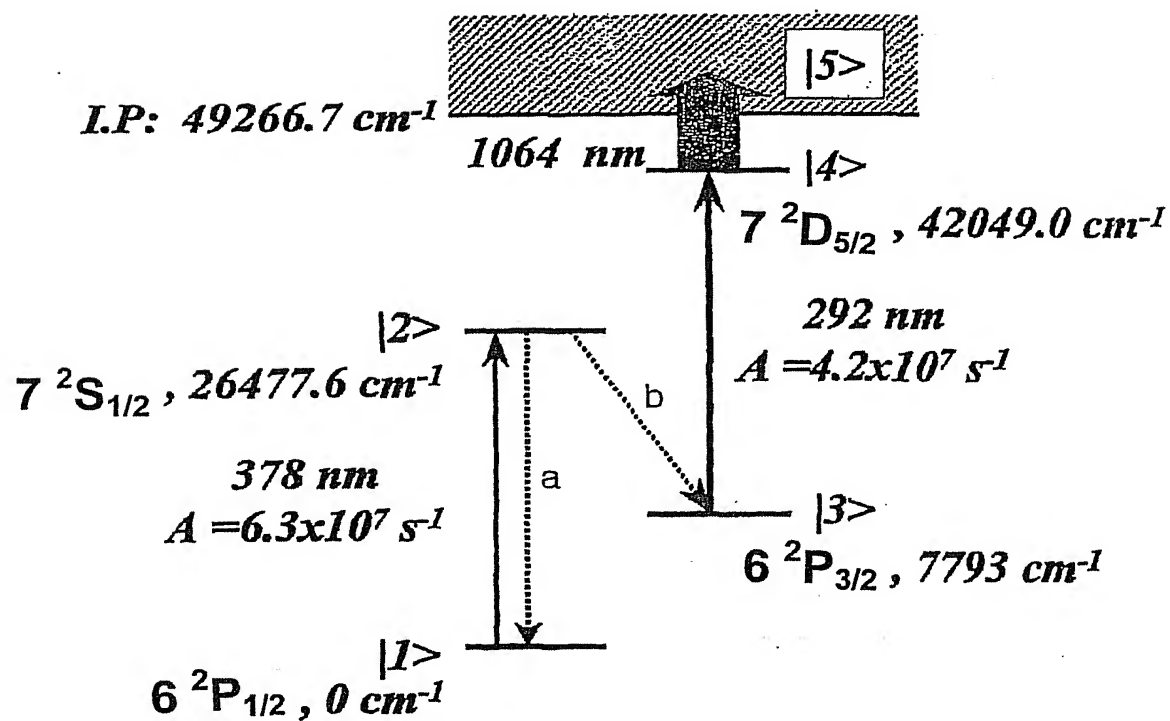


FIG. 2

Appl. No. 10/522,461  
Amdt. dated January 16, 2007  
Reply to Office Action of July 24, 2006  
Attorney Docket No. 1455-050205

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No.	:	10/522,461	Confirmation No. 7554
Applicants	:	Do-Young JEONG et al.	
Filed	:	January 25, 2005	
Title	:	Method for Isotope Separation of Thallium	
Art Unit	:	1753	
Examiner	:	Edna Wong	
Customer No.	:	28289	

MAIL STOP AMENDMENT  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

**AMENDMENT**

Sir:

In response to the Office Action of July 24, 2006, Applicants submit the following amendments and remarks, along with a three-month Petition for Extension of Time and requisite fee.

**Amendments to the Specification** begin on page 2 of this paper.

**Amendments to the Claims** are reflected in the listing of claims which begins on page 6 of this paper.

**Amendments to the Drawings** begin on page 9 of this paper and include an attached replacement sheet and an annotated copy of the replacement sheet showing changes.

**Remarks** begin on page 10 of this paper.

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on January 16, 2007.

\_\_\_\_\_  
Diane Paull

(Name of Person Mailing Paper)

\_\_\_\_\_  
*Klaine Paull*  
Signature

\_\_\_\_\_  
01/16/2007  
Date



5 (d) applying said photons of said first, second and third frequencies to said vapor of said thallium, wherein said photons of said first frequency pump isotope-selectively a plurality of ground state thallium atoms through an excited state into a metastable state, and wherein said photons of said second frequency excite a plurality of metastable metastable state thallium atoms to an intermediate, resonant state, and wherein said photons of said third frequency ionize a plurality of atoms in said intermediate, resonant state through continuum states; and

(e) collecting said isotope ions. --

10 Please replace the paragraphs beginning at page 4, line 6, through page 4, line 27, with the following rewritten paragraphs:

-- Fig.4 Fig. 1 illustrates the conceptual diagram for thallium laser isotope separation method according to the present invention; invention wherein (a) is Fig. 1(a) is a front schematic view and (b) is Fig. 1(b) is a side schematic view of an apparatus for carrying out the method;

15 Fig.2 Fig. 2 shows a partial energy level diagram of thallium atoms;

Fig.3 Fig. 3 shows isotope shifts and hyperfine structures of thallium isotopes;

Fig.4 Fig. 4 shows the experimentally measured optical pumping spectrum of thallium isotopes by using a CW laser which has Gaussian intensity distribution (full width at half maximum: 10 mm) and out put power of 20 mW;

20 Fig.5 shows is the Fig. 5 shows the calculated optical pumping spectrum of thallium isotopes by using a CW laser which has Gaussian intensity distribution (full width at half maximum: 10 mm) and output power of 200 mW;

Fig.6 Fig. 6 shows the measured photoionization cross-section of  $7^2D_{5/2}$  level of thallium atoms at the wavelength of 1064 nm of a Nd:YAG laser; and

Fig.7 Fig. 7 shows the observed mass spectra of isotope-selective photoionization of thallium atoms; atoms wherein:

(a) plot (a) shows the mass spectra of non-selectively photoionized thallium atoms,

(b) plot (b) shows the mass spectra when the frequency of optical pumping laser is resonant with  $^{205}\text{Tl}$  isotopes, and

(c) plot (c) shows the mass spectra when the frequency of optical pumping laser is ~~resonant~~ resonant with  $^{203}\text{Tl}$  isotopes. --

**Please replace the paragraph beginning at page 4, line 31, with the following rewritten paragraph:**

5 -- Herein is disclosed an isotope-selective photoionization process and apparatus for thallium isotope separation from natural thallium that involves isotope-selective optical pumping followed by photoionization of thallium atoms and then electrostatic extraction of ions. This scheme takes ~~advantages~~ advantage of the large optical pumping cross-section as well as the large photoionization cross-section, and consequently only modest laser fluences are required. According to this scheme, it is possible to photoionize target isotopes selectively and efficiently by employing both isotope selective optical pumping (ISOP) of target isotopes into a metastable state and resonant photoionization (RPI) of metastable state thallium isotopes. In the latter process, metastable thallium atoms are photoionized to continuum states through a resonant excited state. Efficient ISOP of the target isotopes can be achieved with a single frequency continuous wave (CW) laser. A pulsed UV laser and a high power pulsed IR laser are used for RPI process. --

10  
15 **Please replace the paragraph beginning at page 5, line 22, with the following rewritten paragraph:**

-- ~~Fig-1~~ Fig. 1 illustrates the conceptual diagram ~~for for the~~ thallium laser isotope separation method. Thallium atomic beam 2 is generated by heating thallium at ~~an~~ temperative at a temperature between 800-1000°C using thermal heater 1 and collimated by an atomic beam collimator 3, and then is optically and isotope-selectively pumped into a metastable state by a CW laser 4. The optically pumped thallium isotopes are photoionized by a pulsed UV laser 5 and a pulsed IR laser 6. The photoionized thallium ions 8 and electrons 9 generated during the photoionization are separated from the atomic beam by an extractor 7 biased by an external electric field. --

20  
25 **Please replace the paragraph beginning at page 6, line 20, with the following rewritten paragraph:**

30 -- Hence, very efficient pumping of thallium atoms into the metastable state can be easily achieved if a CW laser frequency (about 378 nm in the wavelength) is resonant to the transition line of  $6^2P_{1/2}$  and  $6^2S_{1/2}$ . Because the metastable state population of thallium atoms is lower than  $10^{-3}$  when thallium is heated at ~~temperative~~ a temperature to generate an atomic beam, their initial population does not ~~affect on~~ affect the isotope selectivity at this temperature range. --